AGRICULTURE IS ART

ANGELA MASTRONICOLAS
INTERIOR DESIGN

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FRANKLINTON

PLACE

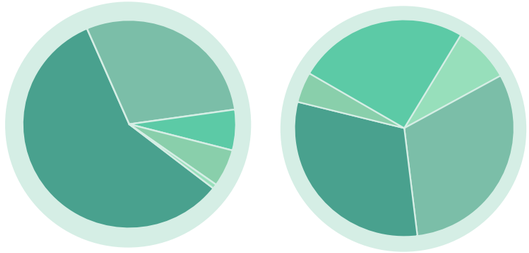
Franklinton is the first settlement in Franklin County, Ohio. The low-lying land was well suited for farming, thanks to the nearby Scioto River.

PEOPLE

The Eastern side of Franklinton houses a growing arts community, while the west side remains full of Franklinton's original history, authenticity, and residents.

PURPOSE

After identifying underlying issues regarding food security and unemployment, I am proposing an interior design solution that will attempt to alleviate some of these problems.



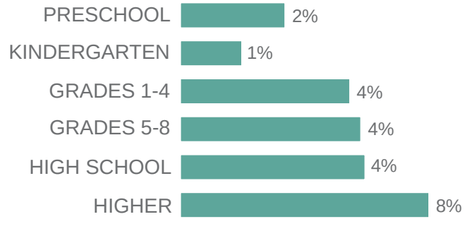
ETHNICITY

- WHITE - 58%
- BLACK - 29%
- MIXED - 6%
- HISPANIC - 6%
- OTHER - 1%

AGE

- 65+
- 40-64
- 22-39
- 18-21
- 0-17

EDUCATION



PROMINENT RESEARCH FINDINGS

IN FRANKLINTON

National Life Expectancy Average: 79

There is a lack of places for **good quality food** in Franklinton, or even food at all. **Food Insecurity** can affect both a persons physical and mental health, and ultimately create an unhealthy and stressful living environment overall.

National Unemployment Average: 3.7%

The most common jobs In Franklinton are healthcare related at almost 15 percent. With most of Mount Carmel hospital shutting down this will create more of a **shortage of jobs.**

Franklinton is 594% more likely to have agriculture related jobs compared to the surrounding areas.

What Franklinton needs:

- **Healthy, easily accessible, food**
- **A sense of community**
- **Jobs**

NEGATIVE IMPACT OF FOOD DESERTS

Food deserts often go hand in hand with food insecurity. Food insecurity means people aren't sure where their food will come from. In addition, they have little-to-no access to nutritious food and are likely to have unbalanced diets and skip meals.

MORE EXPENSIVE FOOD

The U.S. Department of Agriculture estimates that groceries sold in food deserts cost an average of 10 percent more than groceries sold in suburban markets, meaning people in low-income communities impacted by food insecurity may pay more money for their food

UNHEALTHY OPTIONS

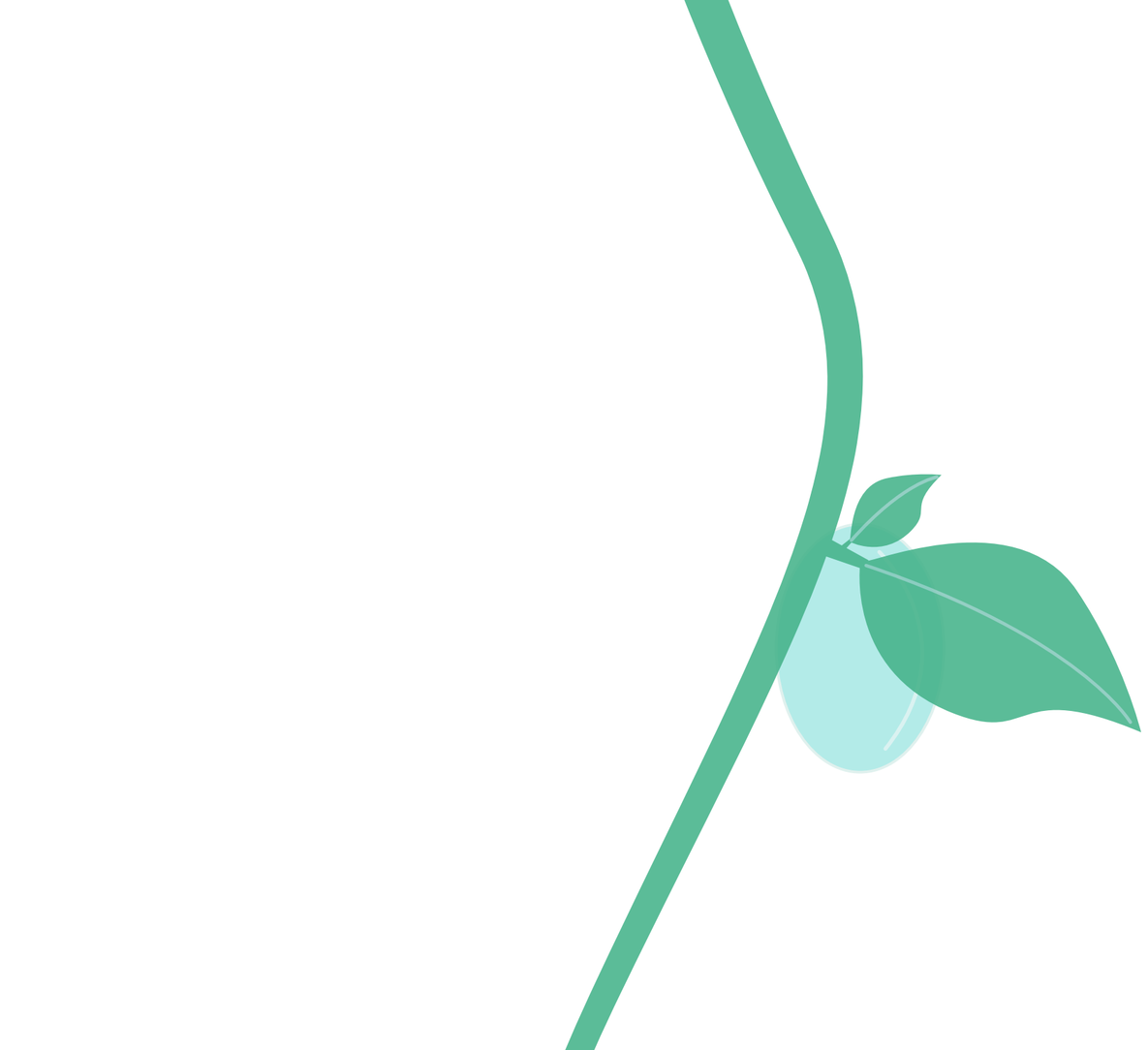
Many communities in food deserts do actually have access to food, but they are usually unhealthy and processed options also known as "fringe foods". These come from fast-food restaurants, small corner convenience stores and liquor stores.

LONG-TERM HEALTH ISSUES

Poor quality foods are also linked chronic illnesses, cancer, cardiovascular disease, diabetes, hypertension and even premature death. When nutritious foods aren't available, it's hard to eat healthily. Food deserts also contribute significantly to obesity among low-income preschool children.

BROAD RESEARCH QUESTIONS

1. **What have other food deserts done to address issues of food security?**
2. **What specific criteria needs to be included into my interior design proposal to help alleviate these issues?**
3. **Are there ways that I can make food options healthier and more affordable at the same time?**
4. **How will my proposal address the need for community and employment, all while providing access to healthy farm fresh meals?**



DESIGN PROPOSAL

A Research-based Interior Design Proposal for Franklinton, Ohio, integrating aeroponic technology with a fresh food market and educational growing spaces.

AGRICULTURE IS ART

Through creating an understanding of what art is and what it can be, I aim to bridge the gap between the growing arts community of East Franklinton, with the authenticity of West Franklinton. The town is full of passionate people, a rich history, and even richer soil, which has historically been cultivated to support an agrarian lifestyle.

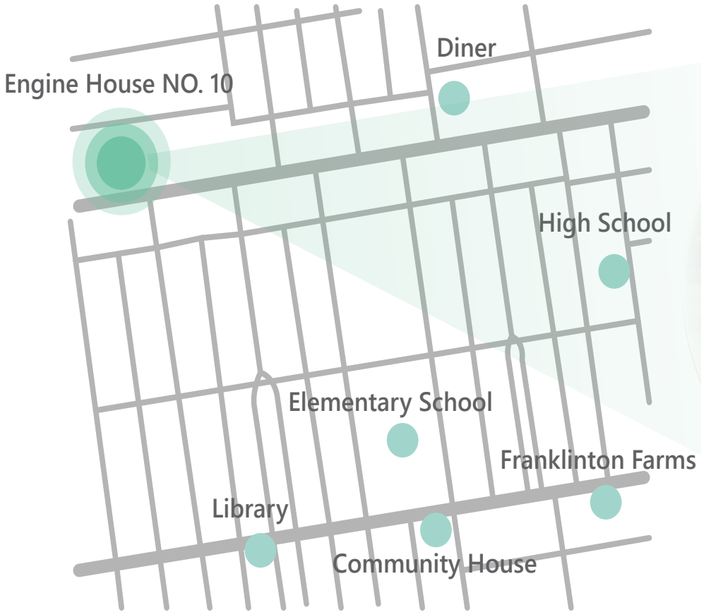
I believe that focusing community effort on an urban farming project, could help the western side of Franklinton re-establish its own identity, create jobs, and bring both the eastern and western Franklinton communities together through different forms of art expression and understanding.

This urban farming project can provide healthy, farm fresh meals to all.

HISTORY

Engine House No.10 (1096 West Broad Street) is a governmental/public use building located in Columbus, OH. Located on 1.25 acres on the north side of West Broad Street, it is surrounded by a coffee shop, gas station, liquor store, and apartment style residential units. The Engine House is a load bearing, brick structure. Built in 1896, it was in use for over 100 years. The engine house closed just a few years ago and was replaced by a new engine house on a neighboring lot to the east.

CONTEXT MAP



This location in West Franklinton is closest to Franklinton Farms, which is one of my partners. There are also not many surrounding facilities with food, so I thought this location would be a good fit.

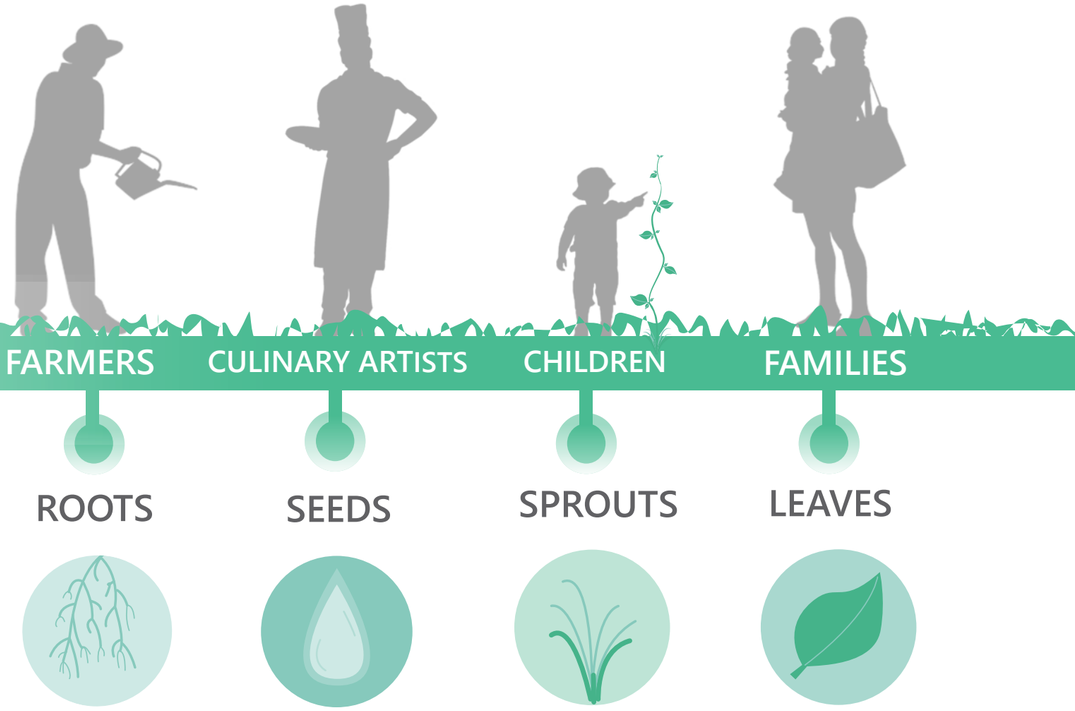
DESIGN GOALS CONTRIBUTE TO:

Culture: A blend of two cultures (eastern and western Franklinton)

Society: Creating a solution to address the issues of food insecurity and better the community

Education: Healthy eating, the benefits of urban farming, how to cook and work as a team.

STIMULATING GROWTH IN ALL USERS



PROGRAM GOALS:

I plan to design a facility where the crops produced at the various Franklinton Farms locations, as well as produce grown on site, can be sold at an actual market place in Franklinton. I will utilize vertical growing techniques such as the ones present in the OSU Urban Gems program. To ensure the food remains affordable, residents are encouraged to help aid in tending to the garden spaces for reduced prices on food. There will be culinary art classes available for residents, and outside members of the community to take as well as an educational space where children can learn about to future of urban farming and growing techniques. The building will also showcase various pieces of artwork for sale created from local artists in or around the area.

PARTNERS

My partners will provide resources and community outreach to help achieve my program goals of creating an aeroponic indoor urban farm, fresh food market and educational growing spaces.

URBAN G.E.M.S.
Gardening Entrepreneurs Motivating Sustainability

Urban GEMS employs cutting-edge vertical food production technology to grow healthy foods while promoting healthy eating in urban neighborhoods characterized as food deserts.

Students gain 21st century employment skills through coursework, internships, and service learning projects.

The Urban GEMS program was designed to address the well documented link between food insecurity and school failure at a neighborhood level. Addressing both the educational and nutritional (basic needs) of young people growing up in economically challenged environments requires new thinking, and Urban GEMS does just that.

Franklinton Farms
Growing Food. Creating Beauty. Building Community.

Franklinton farms is dedicated to growing and sharing food, creating beauty, and building community with their neighbors.

The farm is a multi-acre operation scattered across dozens of urban parcels. Currently there are eleven food production sites, twelve high tunnels, a fruit tree orchard, a berry patch, a micro-greens grow room, a seedling start house, and a learning garden.

Out of a commitment to people and planet, Franklinton Farms uses sustainable agricultural practices that are good for the land, farm workers, and consumers. They use compost, cover crops, and integrated pest management in place of chemical fertilizers and pesticides

THROUGH TECHNOLOGY

I have incorporated the use of vertical growth towers to give new meaning to urban agriculture in Franklinton.

The towers, which use water, nutrients and motorized pumps, are ideal for the growth of herbs, vegetables, fruits and flowers among many other kinds of crops. The seeds are placed in a coconut husk to germinate. Once they are mature enough they will be transferred to the towers to continue the rest of their growing process.

This method of farming yields just as much produce as soil crops and in many cases, more. Produce looks healthier, and because of the coconut husk element, some fruits and vegetables even taste sweeter. This growing method is so unique and beautiful it can help to transform a space into something incredible.

URBAN FARMING

WHAT IS URBAN FARMING?

Simply put, urban agriculture is the act of growing or producing food in urban spaces.

METHODS OF URBAN FARMING

COMMUNITY GARDENS	A community garden is a single piece of land gardened collectively by a group of people.
HYDROPONICS	Hydroponics is a subset of hydro culture, which is a method of growing plants without soil, by instead using mineral nutrient solutions in a water solvent.
AQUAPONICS	A system of aquaculture in which the waste produced by farmed fish or other aquatic animals supplies nutrients for plants grown hydroponically, which in turn purify the water.
AEROPONICS	A plant-cultivation technique in which the roots hang suspended in the air while nutrient solution is delivered to them in the form of a fine mist.

WHY IS THIS IMPORTANT FOR FRANKLINTON?

There are many potential benefits but most importantly, incorporating a large scale urban farming project into Franklinton can help with:

- **Creation of local business**
- **Environmental education**
- **Improved resident health**
- **Economic development**
- **Community Awareness**
- **Local food security**
- **Increase of jobs**

PROBLEMS WITH OUR CURRENT FOOD SYSTEM

LAND USE

Standard farming requires mass amounts of land usage and results in deforestation. Growing conditions have also become more difficult with our changing climate.

AIR POLLUTION

Large quantities of fossil fuels are used in transport. This releases copious amounts of CO2 emissions into the air. Airfreight shipments alone generate 50 times more CO2 than sea shipping.

(Sea shipping is slow, and our increasing demand for fresh food requires quicker methods)

TRAVEL

It is estimated that a standard meal in the United States travel about 1,500 miles to get from farm to plate.

FOOD QUALITY

In order to transport food long distances, much of it is picked while still unripe and then gassed to “ripen” it after transport. It is also typically processed in factories using preservatives to keep it stable for transport and sale.

HOW URBAN FARMING CAN HELP

1

Growing Indoors

Vertical urban farms require far less space and land use. Growing indoors in temperature controlled environments also allows for year round crop cycles, without worrying about the changing climate.

2

Renewing Local Economies

Producing local can benefit our community on a personal level. No need to rely heavily on outside providers for food. This limits the need for excess travel and will result in reduced carbon emissions.

3

More Efficient Systems

Less water, land and other resources are used for more crop yield. Harvest is also farm to table so preservatives are not needed, and produce can be harvested at peak ripeness.

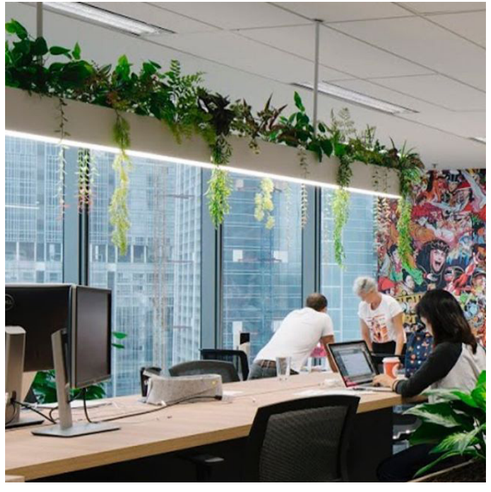
RESEARCH QUESTIONS

1. What can I learn from studying interior design case studies that have integrated complex green house technology?

2. What are the overall benefits of implementing urban agriculture systems instead of relying on traditional farming?

3. How do the specifics of aeroponic technologies work within an interior space?

4. What specific amenities are required to support vegetable and herb growing in an interior space?



CASE STUDIES

STONE ART MUSEUM/ GOA

Architect: GOA

Location:
Chongwu, Fujian, China

Area: 353.0 m2

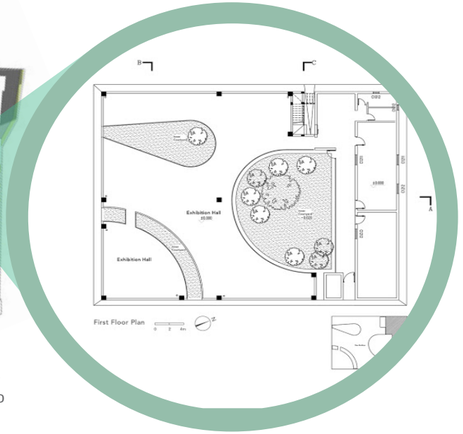
Project Year: 2018

A combination of art
and nature.

The slightly messy scene and busy stone carving workers jointly give a hint about the key to the design: How to create an undisturbed exhibition space in the current environment? How to make up the difference between the sentimental value carried by the old buildings and the use value?

The courtyard inserted links the two halves of the building that respectively represents the past and the future into a complete space. The lively courtyard serves as a natural transition between different space and time that alleviates the sharp contrast between the new and the old buildings.

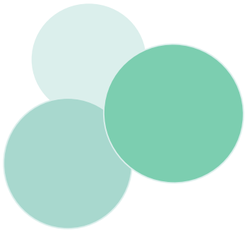
Site Plan



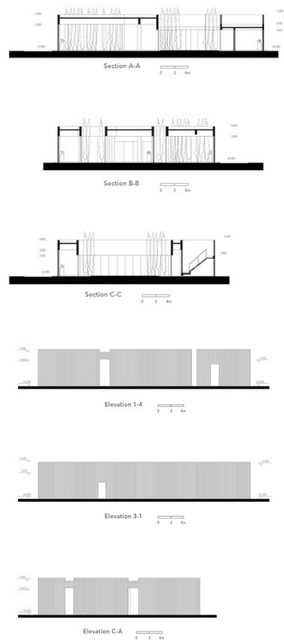
The exhibition hall completed takes on a square shape which is simple and complete. Three gaps are carefully conceived to allow a glance from either inside or outside, implicitly connecting the two spaces.

Parti

This space focuses on connecting past and present through the transition between the three courtyards and the indoor space. The parti is based off of these three circles, representing where the courtyards reside.



Sections/Elevations

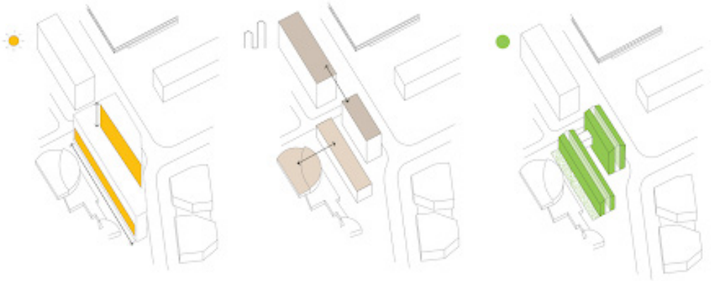


THE FUTURE OF URBAN AGRICULTURE

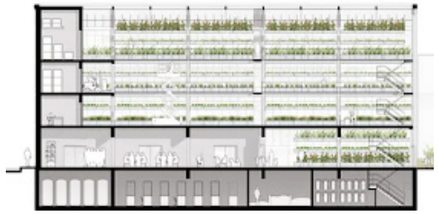
French architecture firm Ilimelgo reimagines the future of urban agriculture with a vertical farming complex in the Parisian suburb of Romainville. The project integrates production of produce into the city through a 1000 square meter greenhouse that maximizes sunlight and natural ventilation.

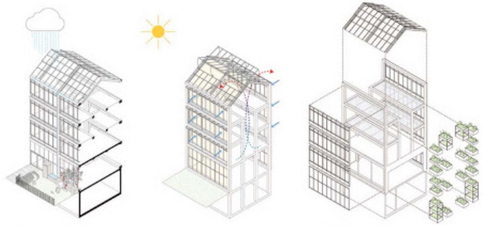
Site Plan

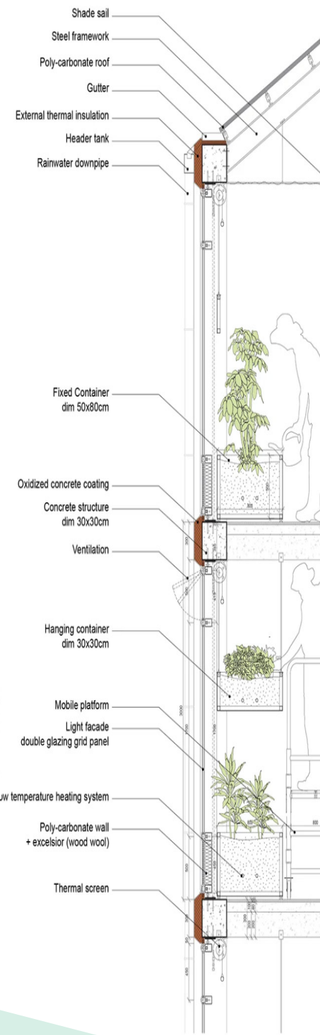
Parti



Recognizing the developing world's diminishing agricultural space, the project aims to meet the growing demands for crop cultivation in urban environments. The ground floor of the building houses educational space, offering workshops and an instructional garden to teach the public about cultivation. Also included on the first floor is a place for crops to be sold.







THE GREEN ISLAND COMMUNITY CENTER

Architects: Estudio Cavernas

Location: Mae Pa, Mae Sot District, Tak, Thailand

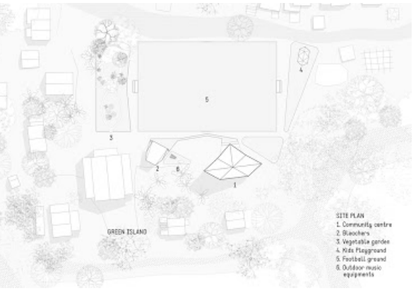
Category: Community Center

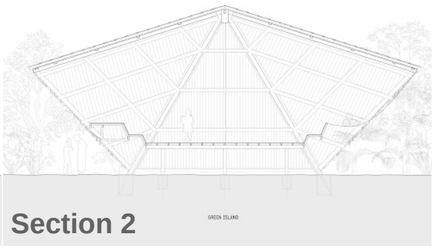
Area: 1590.0 m2

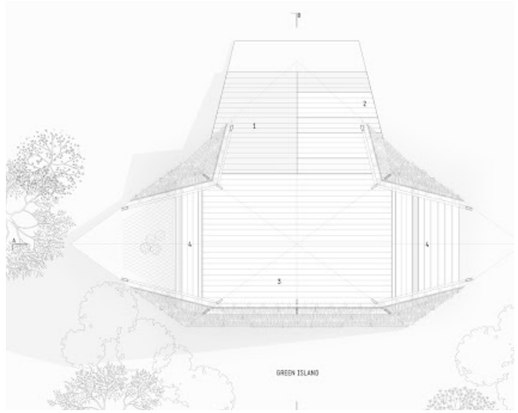
Project Year: 2019

At the heart of a municipal waste center, home to 400 Burmese migrants, lies an island of green and a site where space, power and identity collide

Located at the core of the settlement, the Green Island provides a centrally located, accessible, and safe space where children can learn and play together.

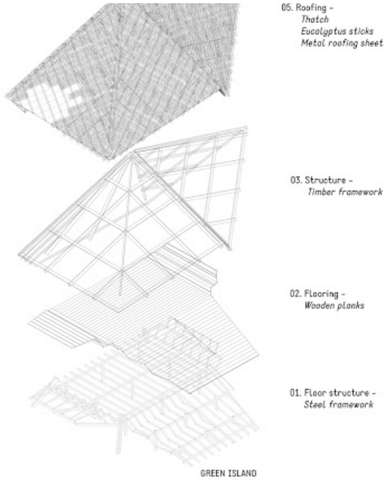


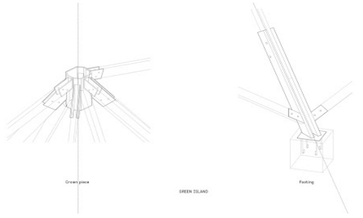




Parti Diagram

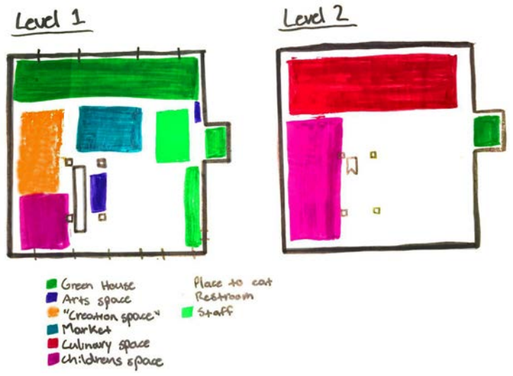
This small community space is made up of four different components. The entrance, the main central space, and two smaller spaces on each side.

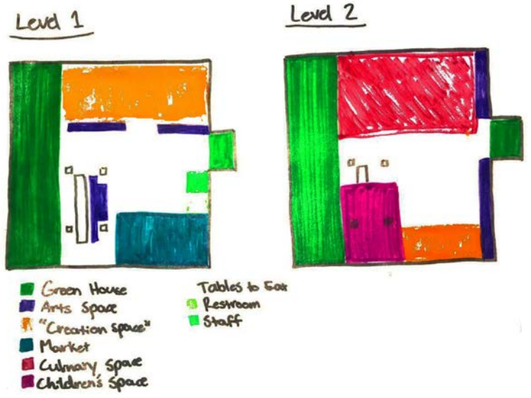


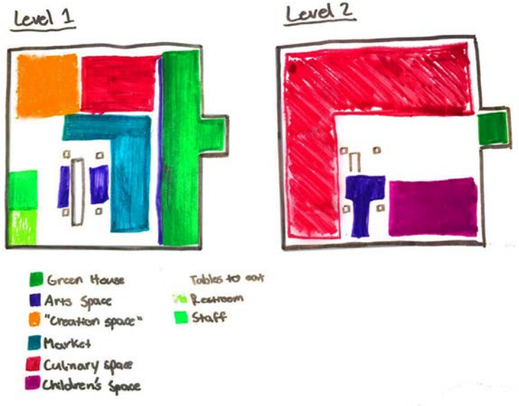


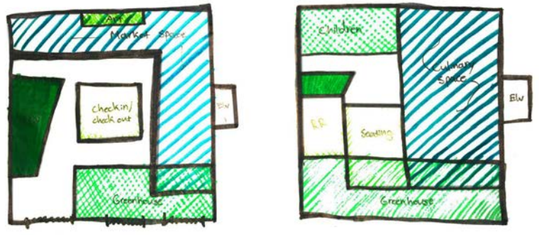
PROGRAMMING

BUBBLE DIAGRAMS









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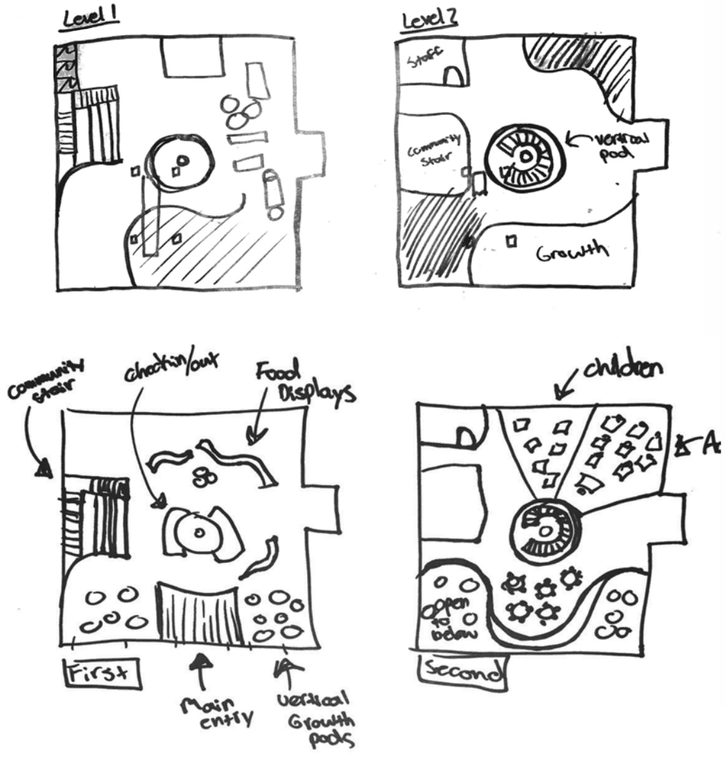
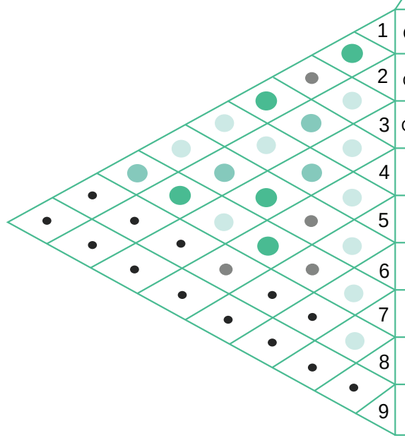


CRITERIA MATRIX



	SPACES	SQUARE FOOTAGE	ADJACENCIES	PUBLIC	DAYLIGHT/VIEW	PRIVACY	PLUMBING	SPECIAL EQUIPMENT	CONSIDERATIONS
1	GREEN HOUSE	2500	2,4	M	Y	L	Y	Y	A collection of smaller spaces throughout.
2	CULINARY SPACE	1200	1,4,7	L	Y	M	Y	Y	
3	CREATION SPACE	900	5,6	M	Y	M	Y	Y	Goes hand in hand with childrens space.
4	MARKET	400	1,2,7	H	N	L	Y	Y	
5	ARTS SPACE	200	3	H	Y	L	N	Y	To display and sell art from the community.
6	ART	300	2,3	L	Y	M	N	Y	Goes hand in hand with creation space.
7	SEATING	400	2,4	H	N	L	N	N	To eat meals created in culinary class.
8	RESTROOMS	400	N/A	H	N	H	Y	N	
9	STAFF	200	N/A	L	N	H	N	N	

* Total Square Footage in Engine House No. 10: **8000 sq. ft.**

- IMMEDIATE
- IMPORTANT
- RESONABLE
- NOT IMPORTANT
- REMOTE

H = HIGH
M = MEDIUM
L = LOW

Y = YES
N = NO

SHORT PROGRAM

	SPACES	# OF UNITS	OCCUPANTS PER UNIT	TOTAL OCCUPANTS	UNIT SQ. FT.	TOTAL SQ. FT
1	GREEN HOUSE	10	1	10	250	2500
2	CULINARY SPACE	20	1	20	60	1200
3	CREATION SPACE	15	3	20	60	900
4	MARKET	1	6	6	400	400
5	ARTS SPACE	2	2	4	100	200
6	CHILDREN'S SPACE	1	8	8	300	300
7	SEATING	10	4	40	40	400
8	RESTROOMS	2	5	10	200	400
9	STAFF	2	5	5	100	200

Total # Of Spaces: 9

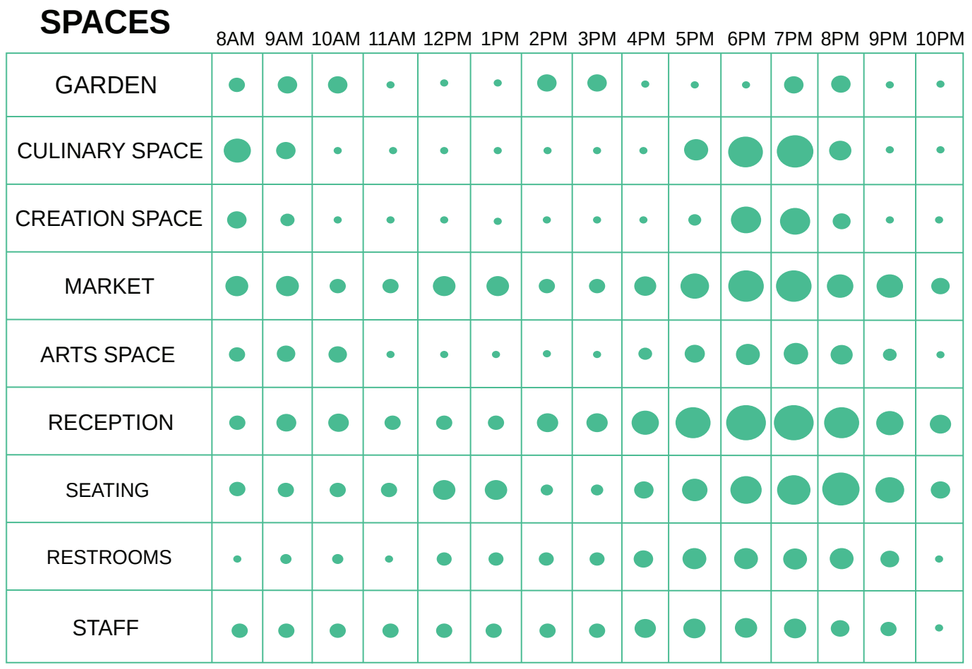
Total Occupants: 60
(Seating, Children's space and Restroom overlap)

Total SQ. FT: 6,500
(Extra 1000 sq. ft.)

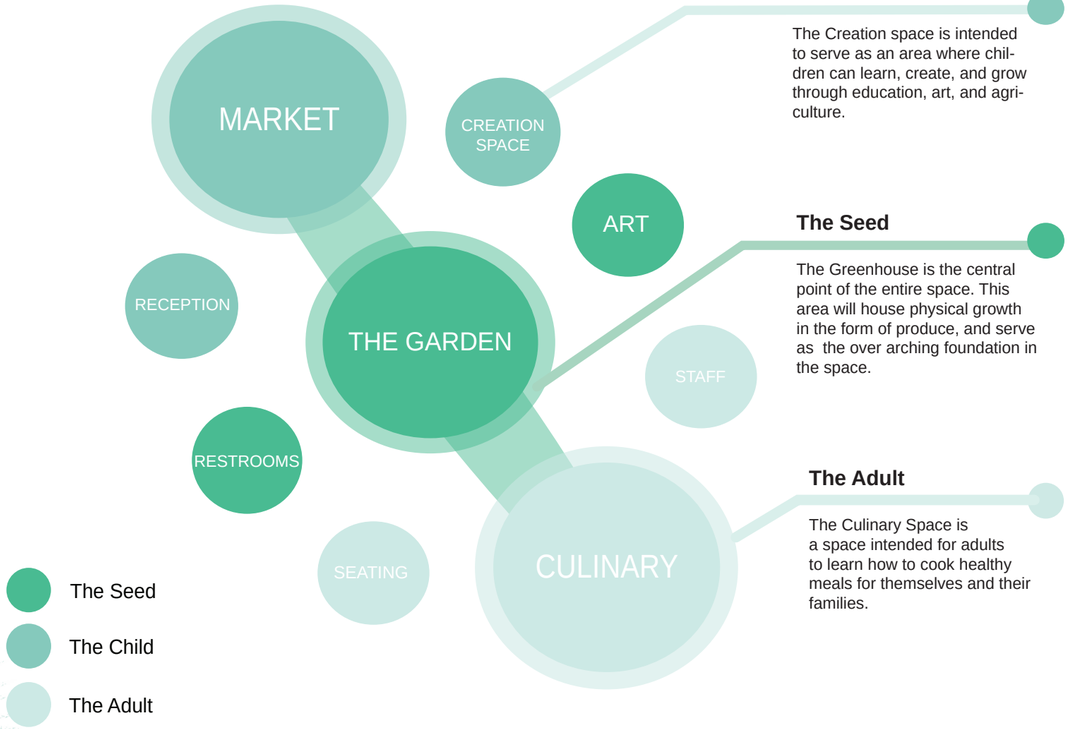
ACTIVITY DESCRIPTION

	SPACES	
1	GARDEN	Fresh produce is grown on site in this space, through the use of hydroponic technology and vertical urban farming growth towers.
2	CULINARY SPACE	Residents of Franklinton, and community members can learn how to cook delicious and helathy meals for themselves and their families in this space.
3	CREATION SPACE	While parents are taking part in a culinary class, their children will be in the creation space. This unique space houses a multitude of creative activites from learning how to plant seedlings, to making art.
4	MARKET	Fresh fruits and veggies grown locally and on site can be sold in this space. The food used in the culinary classes is also taken from this space.
5	ARTS SPACE	There is one designated space in the market for displaying and selling local art, but placed around the entire building are select spaces where art is to be showcased. Some will be for sale and some not.
6	RECEPTION	Customers and community members participating in classes can check-in, and check-out in this space. Information on future events in the space and community can also be found here
7	SEATING	Also referred to as the “Table Talk” space, when participants are finished in the culinary space cooking a meal, they will reconnect in this space to sit and share a meal with other community members.
8	RESTROOMS	The restrooms also house a shower element for the workers in the garden space to rinse off in. We also encourage the homeless to help tend to the gardens and for their work they can take a shower.
9	STAFF	The designated staff room is found behind the reception desk. There are other places in the garden that are only accessable by staff members. This includes specific equipment and supplies.

SPACE UTILIZATION



SPACES



The Child

The Creation space is intended to serve as an area where children can learn, create, and grow through education, art, and agriculture.

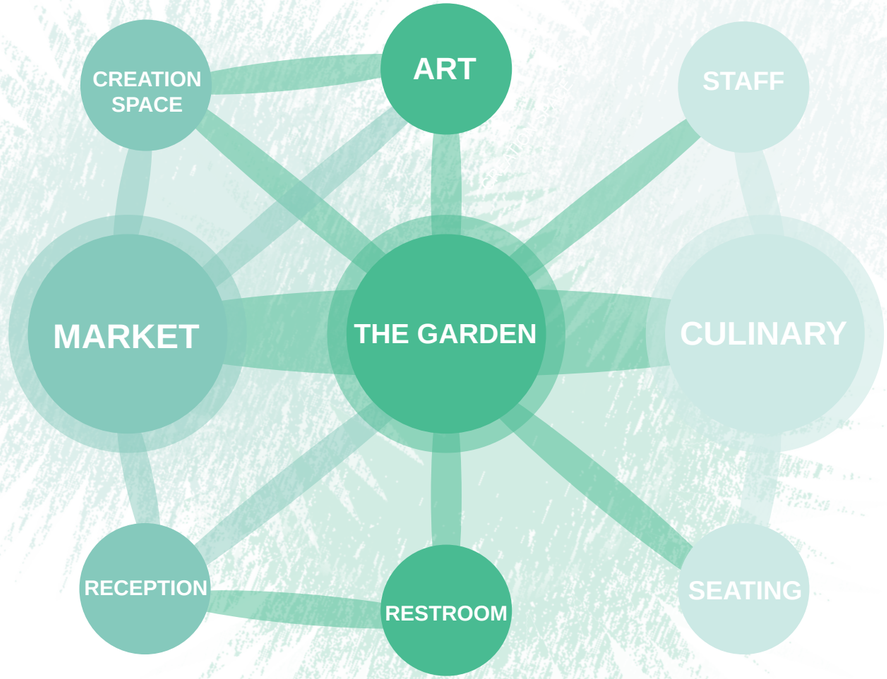
The Seed

The Greenhouse is the central point of the entire space. This area will house physical growth in the form of produce, and serve as the over arching foundation in the space.

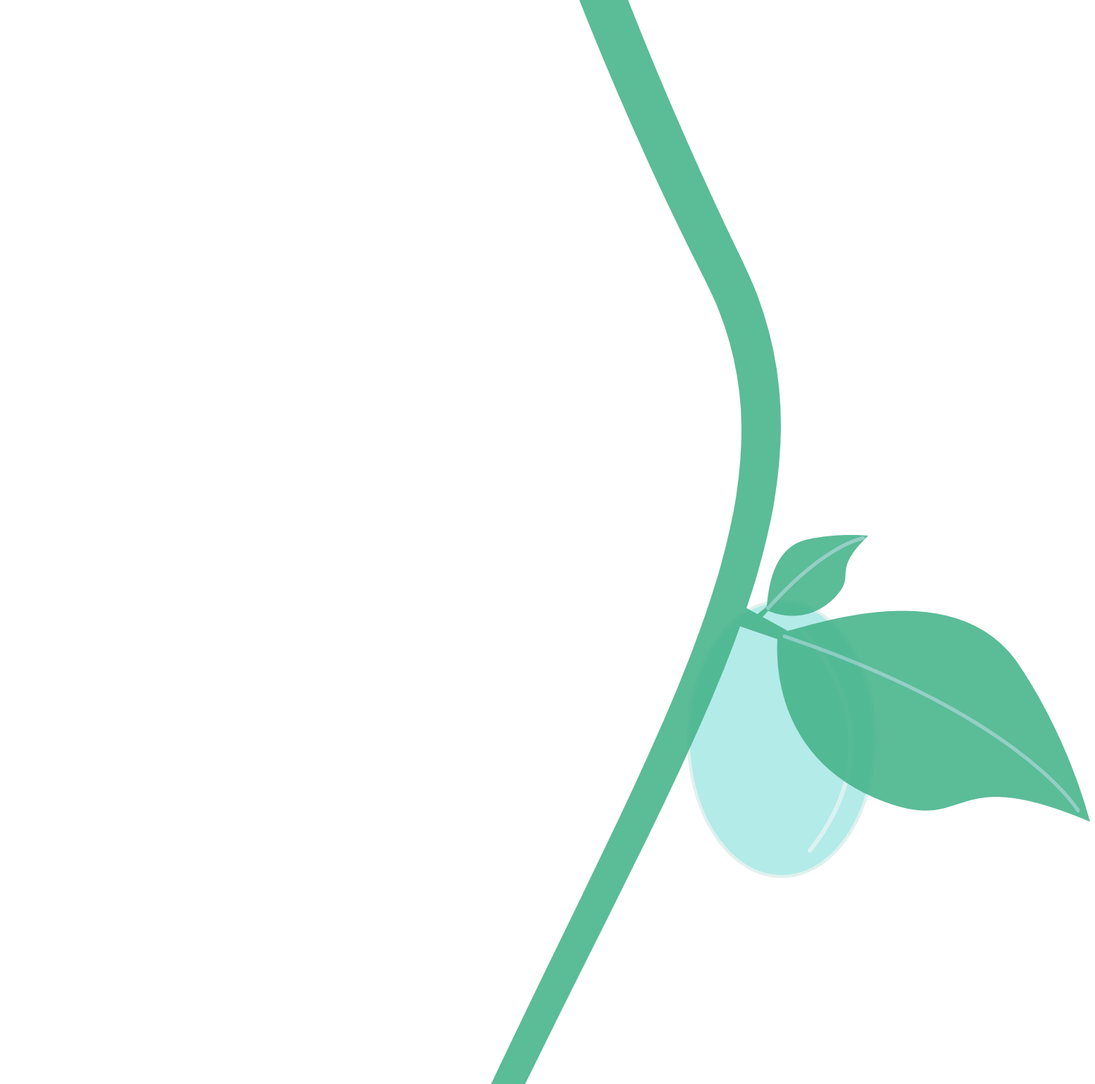
The Adult

The Culinary Space is a space intended for adults to learn how to cook healthy meals for themselves and their families.

ADJACENCIES



DESIGN



BUILDING EXTERIOR

GROWING ELEMENTS

Growth on the outside of the building is eye-catching and alludes to what is inside.

ACTIVE STREET

Being located on a well populated street makes the building easy to access.

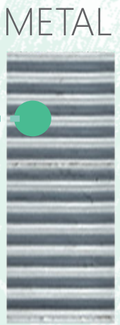
LARGE WINDOWS

Large windows allow outside viewers to get a sneak peak of vertical urban farming towers.

MATERIALS

CORRUGATED METAL

To create an authentic farmers market feel.

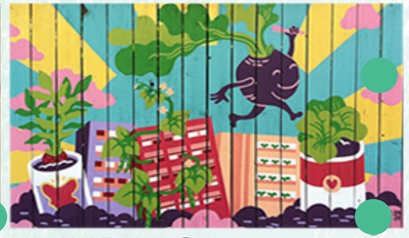


BRICK

To celebrate the existing structure.

LIVING PLANTS

Will bring new life, and farm fresh produce to the space.



PRODUCE

Much of the color in the space will come from naturally grown produce.

MURALS

Will add more artistic elements to the space.

NATURAL WOOD

Creates a warm and earthy atmosphere.

RECEPTION DESK

Community members can check into classes here or checkout their groceries from the market space. Information on upcoming events and activities will also be displayed here.

MARKET SPACE

Locals can shop for fresh produce grown on site in this space as well as pick out specific ingredients that will be used during the culinary classes that they may be participating in.

LOCAL ART

A small section of the market is dedicated to promoting and selling locally crafted and manufactured pieces of art.

GARDEN

Intertwined within the community stair lies the garden space. Full of vertical growth towers, this area houses various different growing fruits and vegetables.

COMMUNITY STAIR

Locals can enjoy this open space while they are waiting for a class, transportation home, or simply to immerse themselves within the fresh growing environment that surrounds them.

CREATION SPACE

Children can part-take in a series of creative classes here while parents are participating in the culinary classes. The art of urban farming is taught here as well as other forms of art and creation such as painting and drawing.

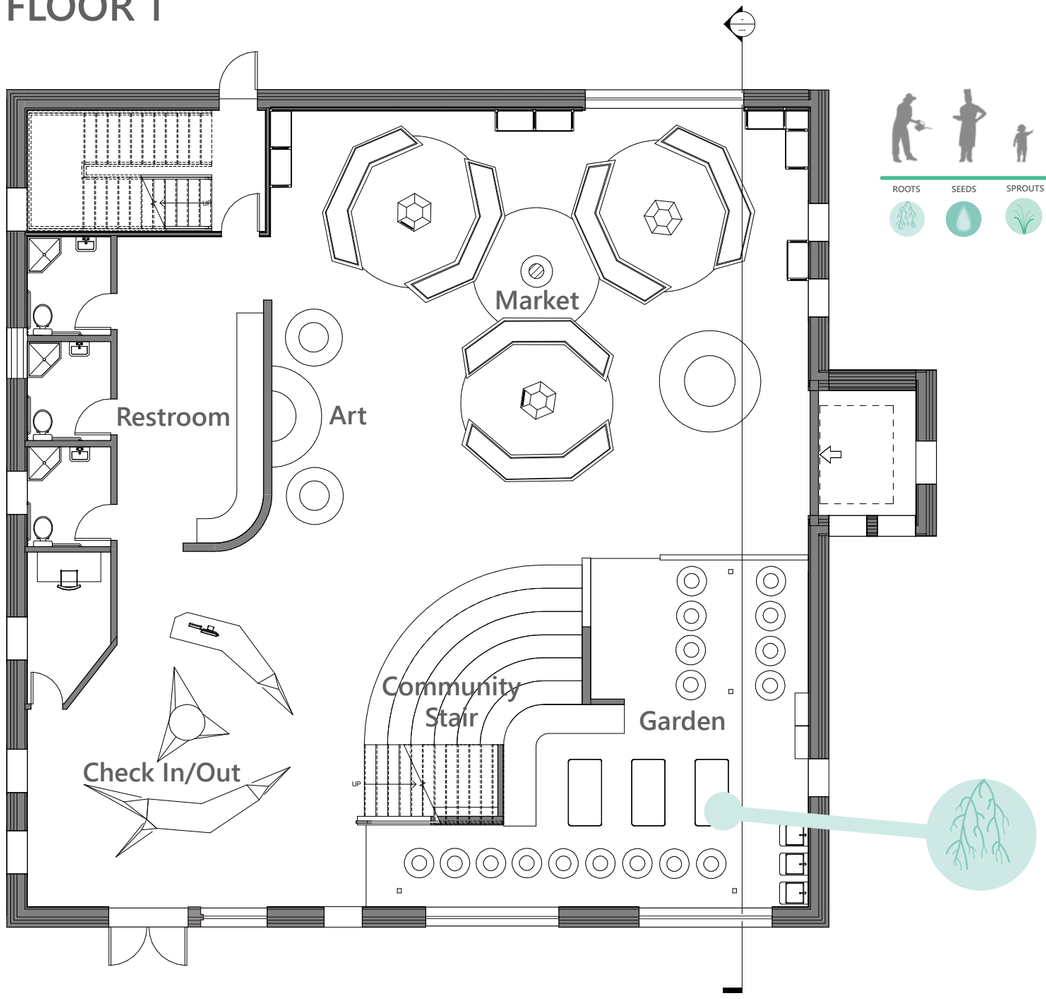
TABLE TALK

Community members reconnect to share a meal together in this space. Important topics and events happening in the neighborhood can be discussed and presented on the board.

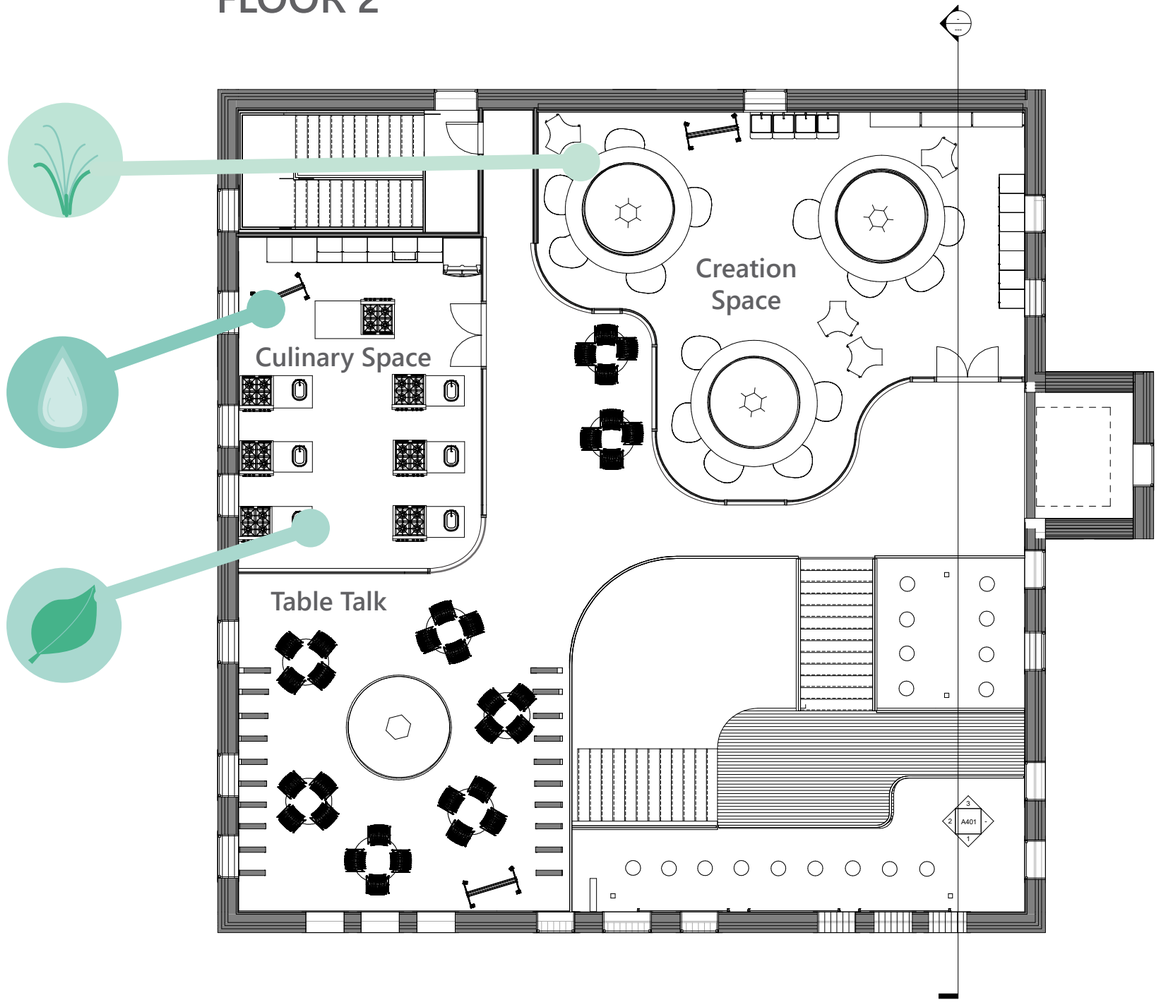
CULINARY ARTS

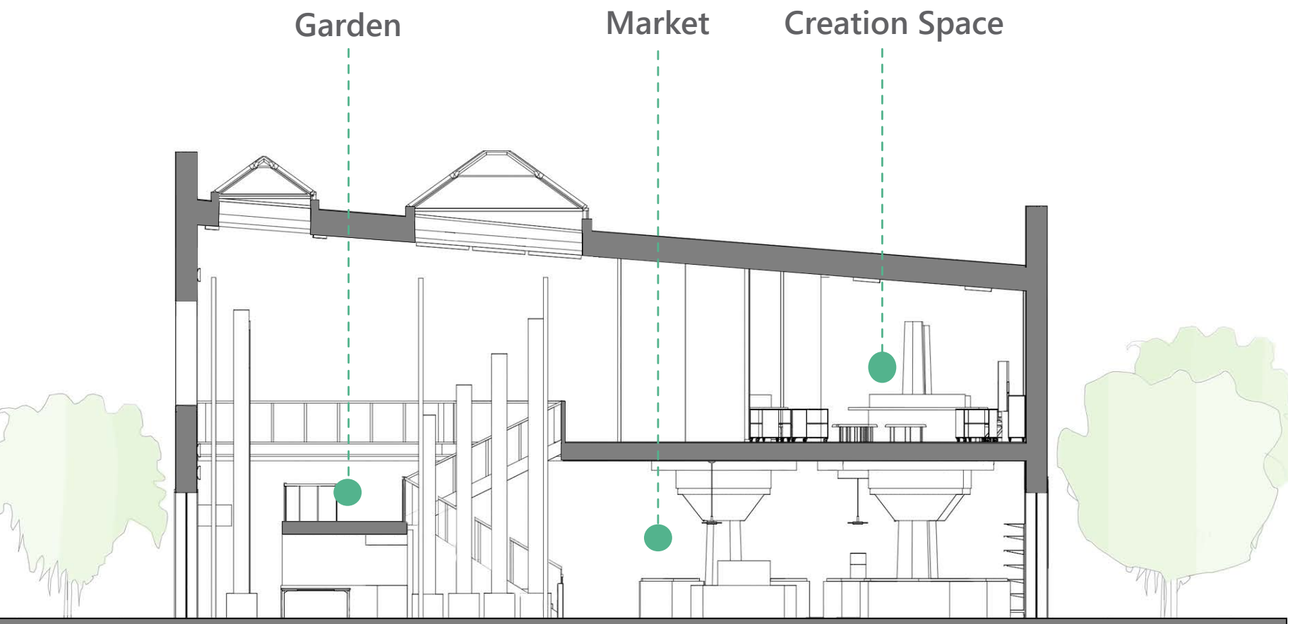
Parents and community members alike can attend classes here to learn how to cook healthy meals using produce grown on site in the garden space.

FLOOR 1

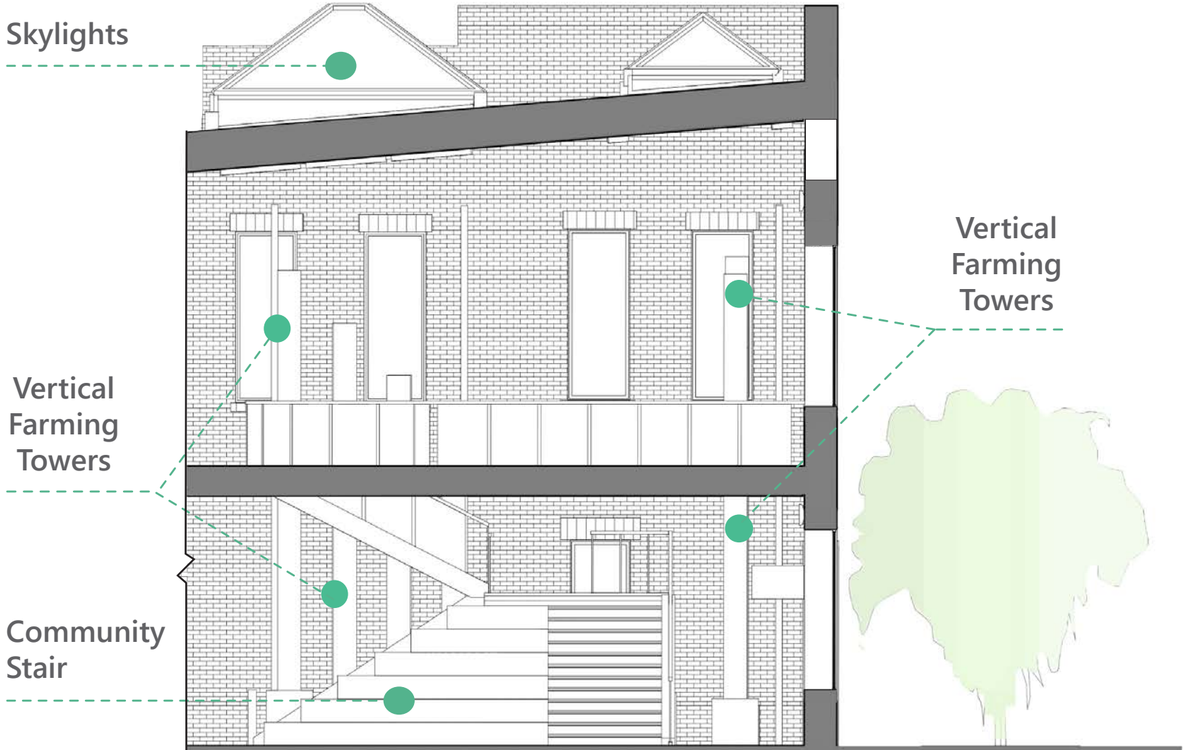


FLOOR 2





SECTION



GARDEN SECTION

GROWING SYSTEMS

GROWING SYSTEMS

(4 ALTERNATIVE OPTIONS)

Located in Columbus's designated zone 3, I will be implementing one of these methods of indoor urban farming into my interior design proposal for Franklinton Ohio.

ZIPGROW

PROS:

- Fits on any wall
- Easy to install
- 95% less water
- Soil Free

CONS:

- Flat design limits placement options
- System is very large
- No Modular pieces

BOWERY

PROS:

- Large scale planting
- Space efficient
- 90 % less water
- No pesticides

CONS:

- Not very customizable
- Flat beds
- Complex watering system

VERTICROP

PROS:

- Customizable pieces
- Cheap construction
- Rotating system
- No pesticides

CONS:

- Flat beds
- System can obstruct sunlight absorption
- Very little human interaction

TOWER GARDEN

PROS:

- Modular pieces
- Integrated pump
- 95% less water
- No pesticides

CONS:

- Expensive
- Small scale
- Little human interaction

SYSTEM SELECTED FOR **1096 WEST BROAD STREET**

TOWER GARDEN BY JUICE PLUS+

Fresh - Local - Sustainable

- Aeroponic system
- Saves on space
- No soil needed

90% MORE FOOD

90% LESS LAND

95% LESS WATER

GROWING MEDIUM

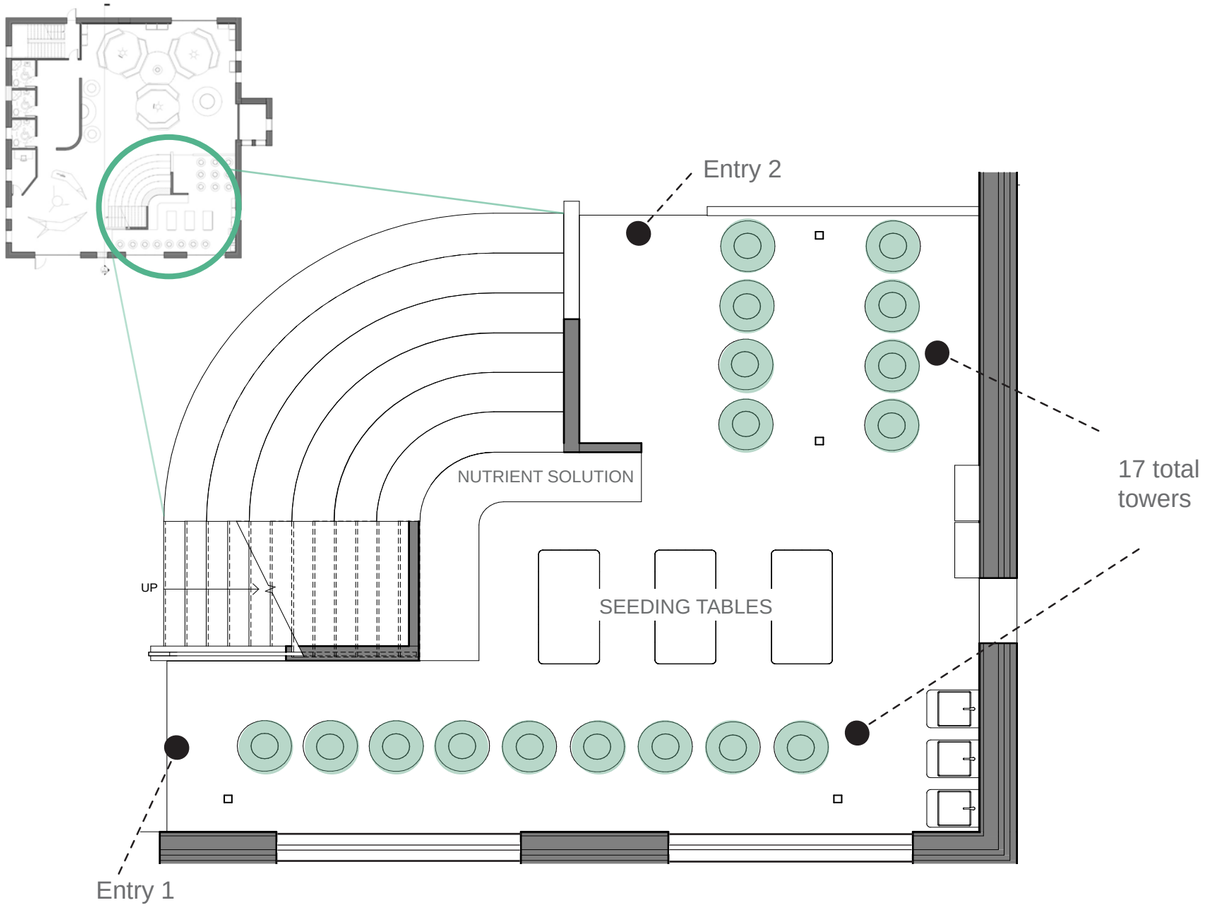
Found that the most efficient germination method for what I am trying to achieve was using coco coir instead of soil.

COCO COIR

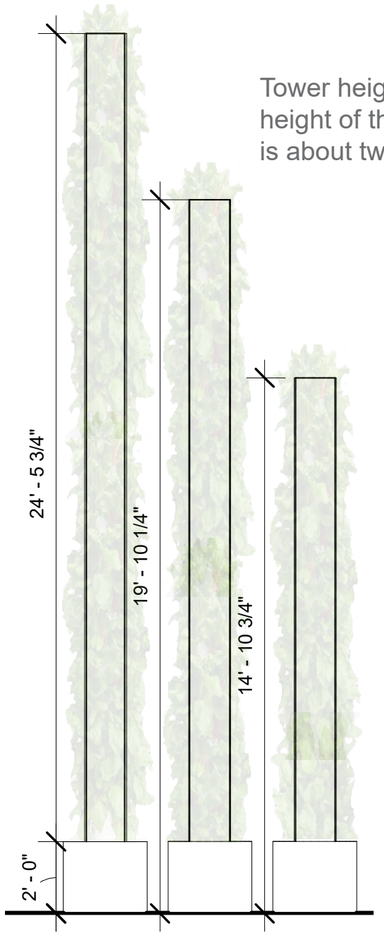
BENEFITS

- By-product of coconut husk
- Normal soil attracts bugs
- No pesticides
- Vegetables taste sweeter
- More abundant
- Contain more nutrients
- High water holding capacity
- No weeding
- Renewable
- Quicker growth period (26-30 days)

PROPOSED TOWER LOCATIONS

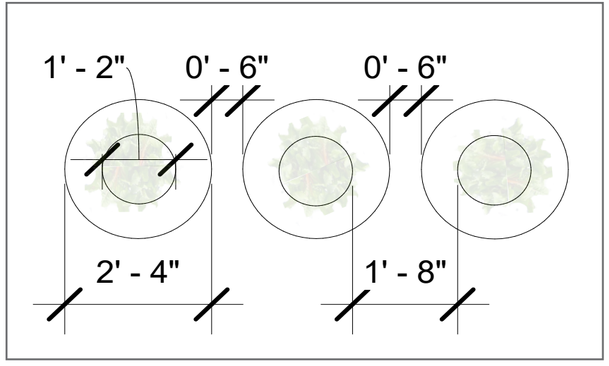


DIMENSIONS



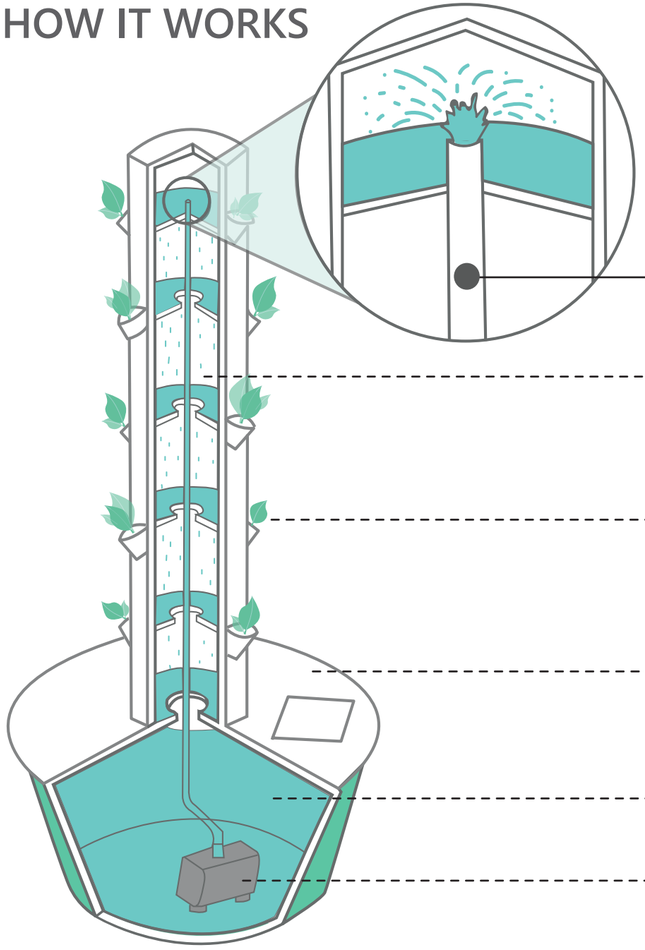
Tower heights vary and do not exceed 25 feet. The approximate height of the tower basin, which houses the nutrient rich solution is about two feet.

PLACEMENT



There is approximately one foot between each tower, and the total width is about 2 1/2 feet.

HOW IT WORKS



Nutrient rich solution is pumped from the tower basin all the way to the top. Gravity takes over and waters all of the plants on the way down.

Gravity filters solution through tower.

Seedlings placed here.

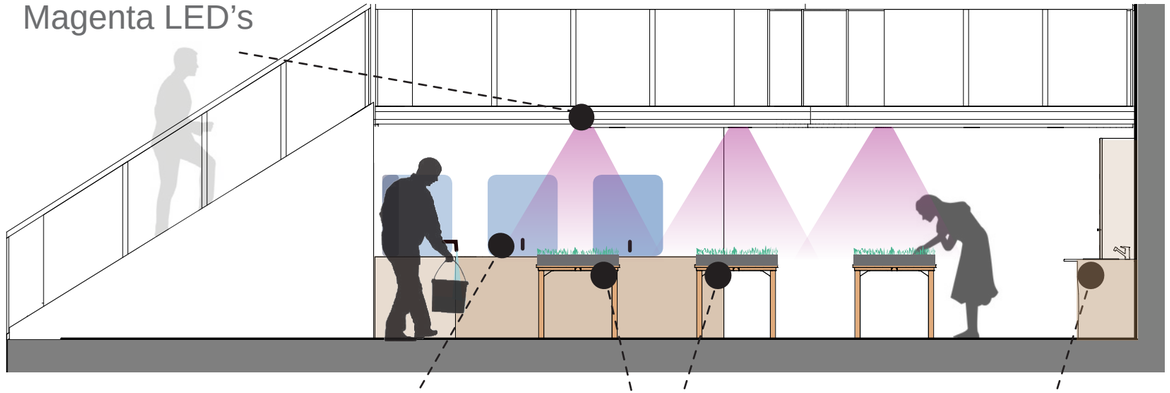
Tower basin

Nutrient rich solution

Pump

SEEDING STATION

Before produce can start growing in the towers they start in the seeding station which is located under the staircase. There are LED can lights in this area to ensure the seeds get plenty of light to grow. The seeds are planted in the coco coir base and once they sprout, they can be placed into the towers to continue the rest of their growing process.



Nutrient Solution

Located in this space is the nutrient solution bins. This solution is eventually transported by bucket into the tower basins.

Seeding Tables

This is where various fruits and vegetables begin their growth process.

Utility Sinks

For watering the seedlings and other emergency situations.

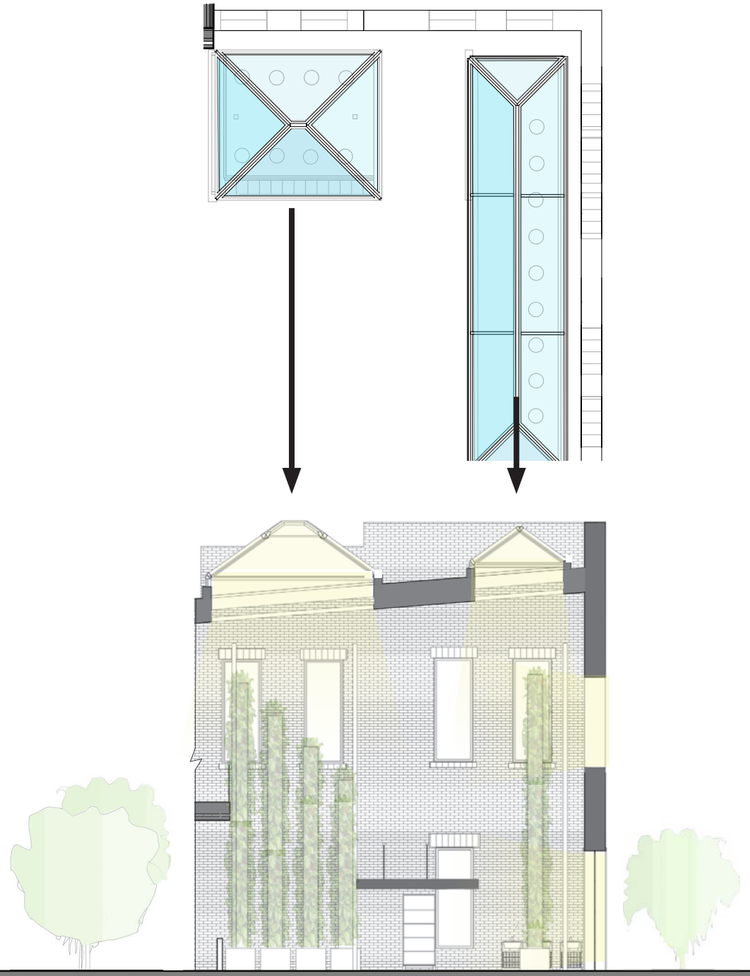
NATURAL LIGHTING

Of course natural sunlight is important in every growing system, indoors or outdoors.

I have two areas where I am proposing the placement of various vertical growth towers, and have places a skylight above each.

The placement of the towers in my space is also closes to the front which is a south facing wall.

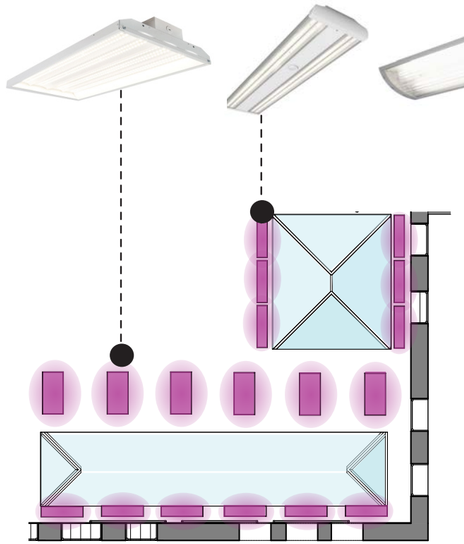
Utilizing the already present windows in this south most wall of this space will allow for ample natural light to enter the space.



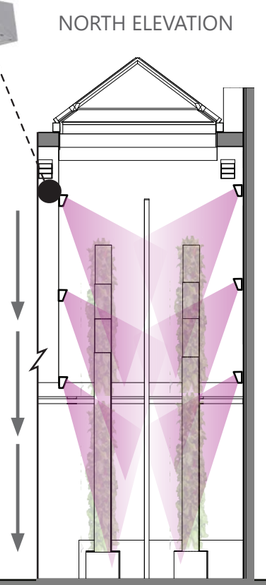
LED LIGHTING

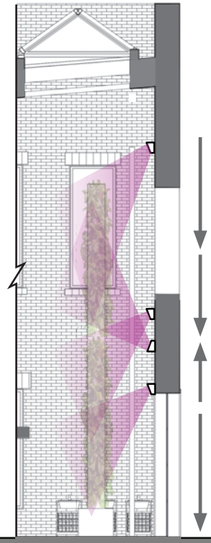
- LED lighting is proven to work best for these types of systems.
- It can mimic sunlight and portray all colors needed in the UV spectrum for healthy growing.
- Altering the light and color can change how plants grow, when they flower, how they taste, their level of vitamins and antioxidants, and can even extend their shelf-life.
- “Pink” light – a mix of red and blue wavelengths is all that a plant really needs to grow.
- LED lights are cooler, which also reduces the amount of overall electricity used.
- Allows for speedy year round crop cycles, sometimes up to 20 percent faster.

PROPOSED LIGHTING



DIRECTION OF LIGHT



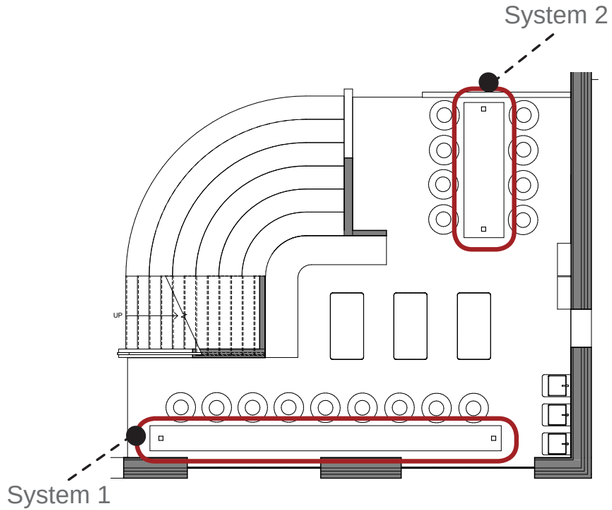


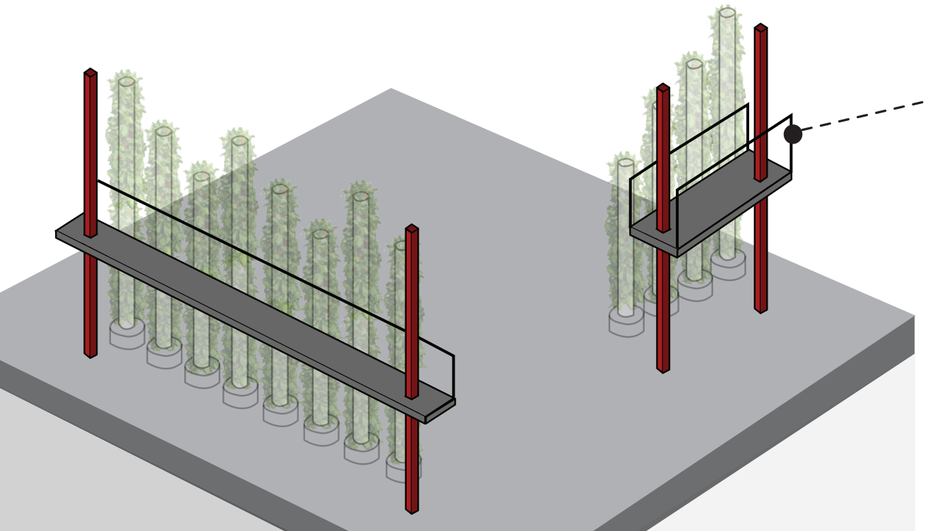
HARVESTING

PUMP JACK SYSTEM

WHAT IS IT?

Pump jacks are a uniquely designed scaffold consisting of a platform supported by moveable brackets on vertical poles. The brackets are designed to be raised and lowered in a manner similar to an automobile jack. They are easily adjusted to variable heights, and are relatively inexpensive.

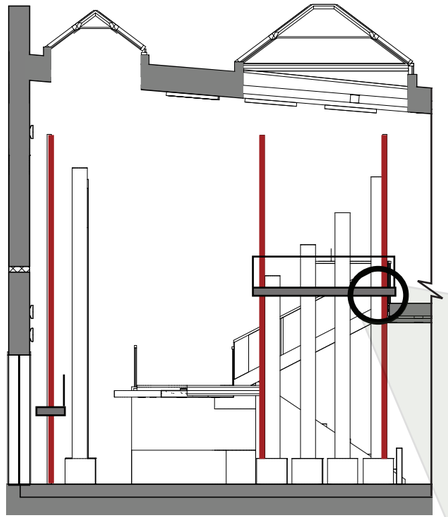




SAFETY BARS

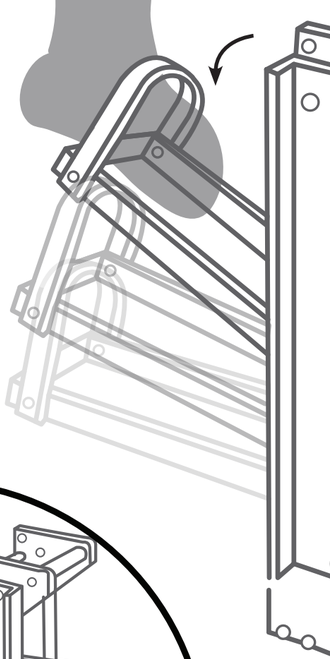
There are safety bars located on the front and back of the systems. Users can strap themselves onto these bars while moving up and down to ensure they will not fall off of the platform.

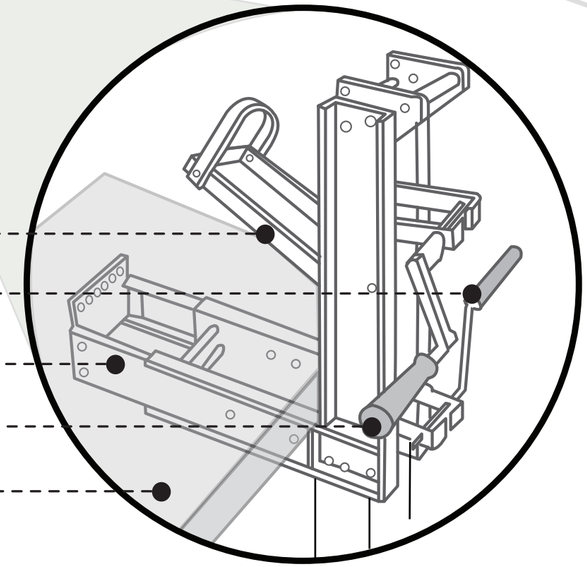
HOW IT WORKS



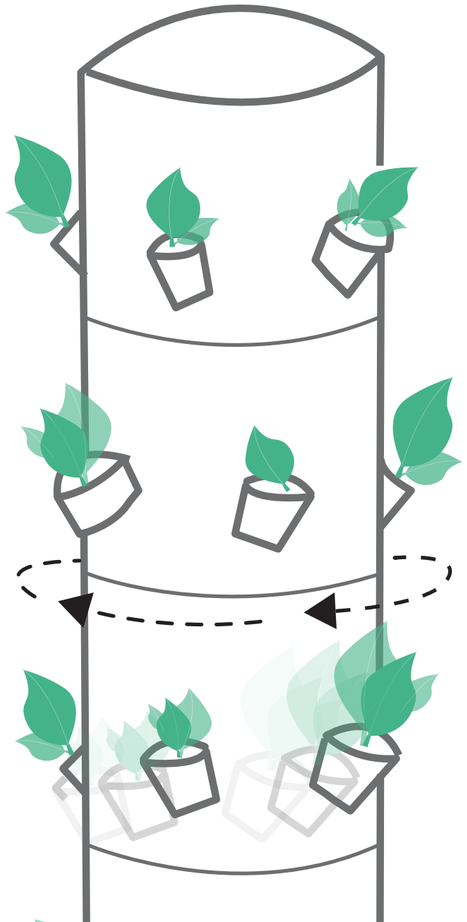
PUMP LEVER

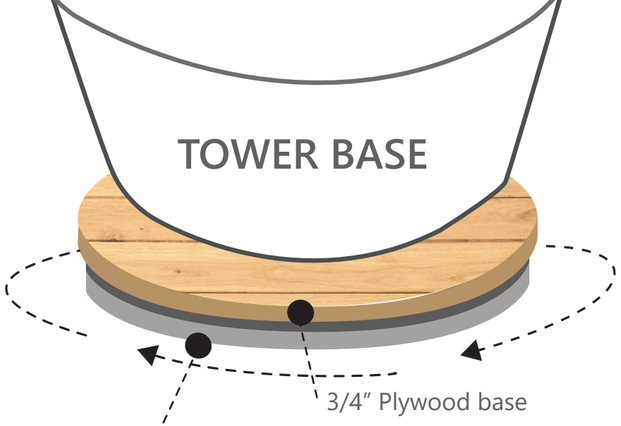
The platform is activated by placing your foot on the “Pump lever” or stirrup, and stepping up and down repeatedly.





SWIVEL SYSTEM





LAZY SUSAN

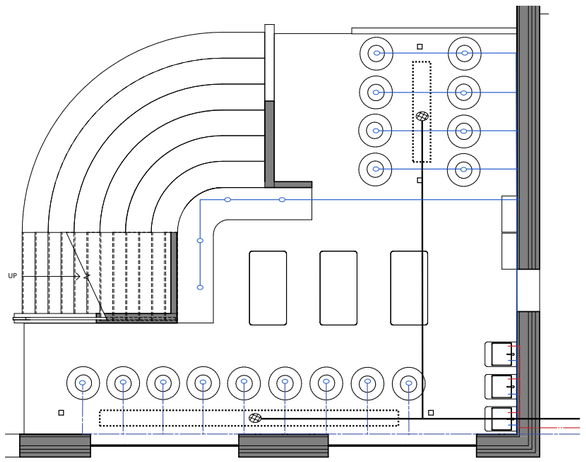
To ensure that the towers are receiving ample lighting, I am proposing a lazy susan swivel system at the base. This allows for the towers to be fully rotated if necessary.

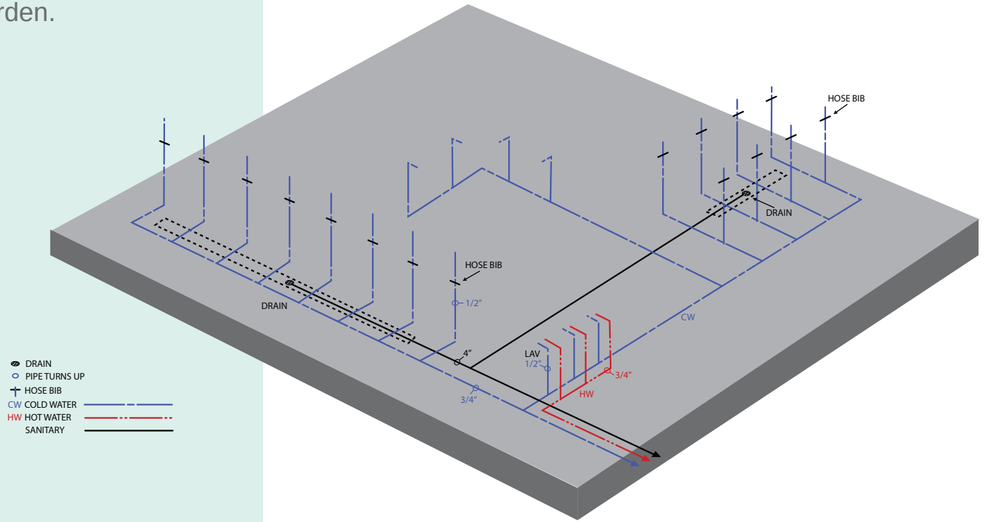
TOWERS

The towers themselves are modular in nature and have attachment pieces. I am proposing that for harvesting reasons, these modular pieces can rotate around fully to allow for easy access.

PLUMBING SYSTEM

Because the average size for a commercial tower is around 15 feet and the towers I am proposing are much larger, there needed to be a plumbing system integrated into my design to efficiently water all of the crops in the garden.





CROP YIELD

This is an example based on heads of lettuce produced.
Different vegetables have different growing rates/yields.

The 17 farming towers that I am proposing will grow:

2040 crops at one time

2652 crops a month

32,000 crops annually

In **650** SQ. Foot of space

2-3 lettuce heads feeds an average person. Being on a rotational system this yield can feed:

1300 people a month

325 people weekly

COMPARED TO TRADITIONAL FARMING?

To grow 2000 heads of lettuce on a traditional farm with soil as the primary growing medium, you would need:

5X

The amount of space.

Each plant is spaced out roughly 12-18 inches.
3060 SQ. Feet needed to yield 2000 crops.

2X

The time to produce the same yield.

The average growing time for a normal head of lettuce is 45-55 days

1/2

The amount of people fed each week.

With the yield taking two times the normal amount to produce, this will result in half the amount of meals fed.

CLOSING THOUGHTS

With urban environments rapidly growing around us, our systems are constantly changing and we are ever-adapting to new ways of life.

My proposal introduces new and innovative greenhouse technology that can help neighborhoods, like Franklinton, address some of their underlying issues regarding food security. Our current food system, as outlined previously, has its own issues with travel, food quality, land use and even pollution. Implementing urban farming technologies into local economies can help resolve all of these issues, and more.

Although this proposal is theoretical, the need for a stable food system in Franklinton, and many neighborhoods alike, is not. My proposal can help future designers think about ways that we can successfully design a space with these issues in mind. Simply bringing the idea of farming indoors can open our eyes to so many new and important opportunities for our future food systems, and interior spaces.

WORKS CITED

Baker, Maurina. “What Is Urban Agriculture, and Why Is It Important?” Farm Progress, 8 Dec. 2018, www.farmprogress.com/marketing/what-urban-agriculture-and-why-it-important.

Bowery, boweryfarming.com/how-it-works.

Contributors, HowStuffWorks.com. “What Is Aeroponics?” HowStuffWorks, HowStuffWorks, 9 Mar. 2011, home.howstuffworks.com/lawn-garden/professional-landscaping/what-is-aeroponics.htm.

“Home.” ZipGrow, zipgrow.com/?gclid=Cj0KCQjwj7v0BRDOARIsAGh37ipsulLVqcNFTcc9hRfWXie_TODm7_mdF6PDIIwbDfyKhz1kwIIj5-4aAqebEALw_wcB.

“How Far Does Your Food Travel to Get to Your Plate?” CUESA, 5 Feb. 2018, cuesa.org/learn/how-far-does-your-food-travel-get-your-plate.

“How to Grow Lettuce - Gardening Tips and Advice, Vegetable Seeds and Plants at Burpee.com.” How to Grow Lettuce - Gardening Tips and Advice, Vegetable Seeds and Plants at Burpee.com, www.burpee.com/gardenadvicecenter/vegetables/lettuce/all-about-lettuce/article10236.html.

“Indoor Vertical Farm 'Pinkhouses' Grow Plants Faster With Less Energy.” Inhabitat Green Design Innovation Architecture Green Building, inhabitat.com/indoor-vertical-farm-pinkhouses-grow-plants-faster-with-less-energy/.

Kumar, Rohit. “Five Reasons Why Urban Farming Is the Most Important Movement of Our Time.” GOOD, GOOD, 1 Aug. 2019, www.good.is/articles/five-reasons-why-urban-farming-is-the-most-important-movement-of-our-time.

LeBlanc, Rick. “Grow Light Options for Indoor and Vertical Farming.” The Balance Small Business, The Balance Small Business, 27 Feb. 2019, www.thebalancesmb.com/grow-light-options-for-indoor-and-vertical-farming-4147429.

Trimarchi, Maria. “What's a Food Desert?” HowStuffWorks Science, HowStuffWorks, 27 Jan. 2020, science.howstuffworks.com/environmental/green-science/food-desert1.htm.

“UNITED STATES DEPARTMENT OF LABOR.” Scaffolding ETool | Supported Scaffolds - Pump Jack | Occupational Safety and Health Administration, www.osha.gov/SLTC/etools/scaffolding/supported/pumpjack.html.

Vyas, Kashyap. “13 Vertical Farming Innovations That Could Revolutionize Agriculture.” Interesting Engineering, Interesting Engineering, 12 Mar. 2020, interestingengineering.com/13-vertical-farming-innovations-that-could-revolutionize-agriculture.

“What Is Coco Coir? [Full Breakdown]: Growers Soil.” Growers, 28 May 2019, growerssoil.com/what-is-coco-coir/.

“What Is Hydroponics? - A Simple Introduction.” Explain That Stuff, 19 Apr. 2020, www.explainthatstuff.com/hydroponics.html.

“‘Lettuce’ Get Growing: Tower Garden Tips for Lettuce.” Juice PLUS+, www.towergarden.com/blog.read.html/

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